Flathead Chub
Species Conservation Assessment Update

Title of Assessment: Flathead Chub (*Platygobio gracilis*): A Technical Conservation Assessment, USDA Forest Service, Rocky Mountain Region

Authors: Frank J. Rahel and Laura A. Thel

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Update Author: Gary P. Beauvais

Date of Update: July 1, 2006 - September 1, 2006

Distribution: The current literature supports the standing notion that flathead chub range is stable in the west of Region 2 (sources 6, 8, 10, 12, 14), but continues to contract in the east (see especially sources 9 and 17 [R. Schneider/ S. Schainost]). This literature also supports standing ideas as to the causes of this pattern: channelization and reservoir construction removes the fine substrate, seasonal turbidity, naturally fluctuating hydrograph, and shallow, low-velocity border habitat preferred by flathead chub. These changes are cumulative as one moves downstream, and thus are most prominent in eastern segments of Great Plains streams.

Taxonomic Status: Taxonomic status of flathead chub remains unchanged. Mitochondrial DNA analysis supports previous ideas of genus-level taxonomy (source 13).

Agency Status: Flathead chub has been identified as a priority conservation species in the Colorado (source 3) and Kansas (source 16) Comprehensive Wildlife Conservation Strategies. Furthermore, source 9 recommends a species status change from state-Threatened to state-Endangered in Kansas.

Other: No other substantial findings to report.

Significance of Change Relative to Original Assessment: The reviewed sources essentially affirm previous assumptions about flathead chub ecology and status in the region. There appears to be no substantial change in knowledge regarding this species.

Positive Findings of New or Updated Information and Their Sources

(Note: The Table A checklist attached to this update provides a summary of all sources consulted)

Source 1

Barko, V.A., M.W. Palmer, and D.P. Herzog. 2004. Influential environmental gradients and spatiotemporal patterns of fish assemblages in the unimpounded Upper Mississippi River. American Midland Naturalist 152:369–385.

Summary of New Information

This study did not directly involve flathead chub, but rather the fish assemblage in an unimpounded section of the upper Missouri River that either previously supported flathead chub, or perhaps still supports the species but at a very low abundance. The distribution of species in this assemblage was determined by river elevation, water velocity, conductivity, and depth, especially as these factors varied by main channel vs. side channel environments. A 500-year flood event in 1993 may have

led to a spawning pulse in flooded terrestrial habitats that significantly changed the fish assemblage (i.e., promoting abundance of off-channel spawners), as detected in 1995. See source 2.

Relevant Sections of the Conservation Assessment Affected by the Updates

Biology and Ecology, Habitat, Community Ecology

Source 2

Barko, V.A., D.P. Herzog, and M.W. Palmer. 2004. Relationship among fish assemblages and main-channel-border physical habitats in the unimpounded Upper Mississippi River. Transactions of the American Fisheries Society 133:371–384.

Summary of New Information

This study did not directly involve flathead chub, but rather the fish assemblage in an unimpounded section of the upper Missouri River that either previously supported flathead chub, or perhaps still supports the species but at a very low abundance. Species richness was greater at wing dikes for both adult and age-0 fishes when compared with main channel borders. River elevation, water transparency, and sampling gear type apparently also affected estimates of species richness. See source 1.

Relevant Sections of the Conservation Assessment Affected by the Updates

Biology and Ecology, Habitat, Community Ecology

Source 3

Colorado Division of Wildlife. 2005. Colorado's comprehensive wildlife conservation strategy. Colorado Division of Wildlife. Denver, Colorado, USA.

Summary of New Information

This document is the Comprehensive Wildlife Conservation Strategy for the state of Colorado, and is guided by the following principles: (1) encourage and support conservation actions that meet the needs of species of greatest conservation need; (2) manage for healthy key habitats and ecosystems so that all species of greatest conservation need will benefit; (3) create a strategy that will be flexible enough to incorporate new research findings and successful management innovations; (4) acknowledge the pivotal role that private landowners and local stakeholders play in conservation; (5) enhance, not replace, other planning efforts; and (6) maintain an atmosphere of cooperation among wildlife managers, landowners, private and public land managers, and other stakeholders. Flathead chub is identified as one of Colorado's species of greatest conservation need, and as such is described in this plan as to its distribution, status, habitat use, threats, and likely responses to particular management actions. The grasslands of eastern Colorado are described as being in the poorest condition, and hence in most need of conservation attention, of all ecological systems in the state - it may be inferred that streams embedded in these grasslands are in similarly poor condition, and of similarly high conservation priority. This source provides a long list of management recommendations for flathead chub habitat, both in its own text and by source to other sources. See source 16.

Relevant Sections of the Conservation Assessment Affected by the Updates

Existing Regulatory Mechanisms, Mgmt Plans, and Conservation Strategies, Biology and Ecology, Distribution and abundance, Population trend, Habitat, Threats, Conservation Status of the Flathead Chub in Region 2, Potential Management of the Species in Region 2

Source 4

Cowley, D. 2006. Strategies for ecological restoration of the Middle Rio Grande in New Mexico and recovery of the endangered Rio Grande silvery minnow. Reviews in Fisheries Science 14: 169-182.

Summary of New Information

The middle Rio Grande River of New Mexico has been extensively altered by humans over the past century, which has significantly changed its fish fauna. This source details many of these changes, and outlines the management actions most important to re-establishing the pre-alteration conditions necessary for the recovery of the Rio Grande silvery minnow (*Hybognathus amarus*). It may be presumed that many of these priority actions would also benefit other native fish, such as the flathead chub, in this system.

Relevant Sections of the Conservation Assessment Affected by the Updates

Existing Regulatory Mechanisms, Mgmt Plans, and Conservation Strategies, Threats, Conservation Status of the Flathead Chub in Region 2, Potential Management of the Species in Region 2

Source 5

Doisy, K.E. and C.F. Rabeni. 2004. Effects of suspended sediment on native Missouri fishes: a literature review and synthesis. Department of Fisheries and Wildlife / Missouri Cooperative Fish and Wildlife Research Unit, University of Missouri - Columbia. Columbia, Missouri, USA.

Summary of New Information

This source summarizes existing knowledge on the effects of suspended sediment on fishes native to Missouri streams. Conclusions are rather general, owing mostly to a lack of data on fish responses to different levels and types of sediments. Relevance to flathead chub is inferred, as this species was not a specific analytical focus. Native warmwater fish are generally well-adapted to high sediment loads, particularly when such loads are of short duration, as would be expected under natural flood regimes. Prolonged high sediment loads, as might occur downstream of persistent mining operations, are likely more detrimental than seasonal flooding or decadal-scale floods. Juvenile fish are generally more susceptible to high sediment loads than adults, suggesting that managers should focus on maintaining high-quality habitat for juveniles, including off-channel environments where juveniles can escape sediment laden water during flood episodes.

Relevant Sections of the Conservation Assessment Affected by the Updates

Biology and Ecology, Habitat, Threats,Potential Management of the Species in Region 2

Source 6

Duehr, J.P. 2004. Fish and habitat relations at multiple spatial scales in Cheyenne River Basin, South Dakota. MS Thesis, South Dakota State University. Brookings, South Dakota, USA.

Summary of New Information

Streams in western South Dakota were classified into 4 types based on channel geomorphology and size: large rivers, small rivers, steep streams, and flat streams. Fish sampling in each type confirmed the long-standing notion that most Great Plains fishes are habitat generalists - most fish species occurred in most river/ stream types. Ten fish species, including flathead chub, were more abundant in large and small rivers than in streams. Ten other fish species were more abundant in the stream types than in rivers. Fish communities in the Great Plains are temporally dynamic, with frequent cycles of local species extirpation (often resulting from stream intermittency or complete stream drying) followed by re-colonization (which occurs most rapidly on stream reaches near source populations in mainstem rivers or impoundments). Distance to mainstem river correlated most strongly with fish species richness, and ratio of impoundment area-to-watershed area correlated most strongly with fish species evenness.

Relevant Sections of the Conservation Assessment Affected by the Updates

Biology and Ecology, Habitat, Community Ecology

Source 7

Durham, B.W. and G.R.Wilde. 2005. Relationship between hatch date and first-summer growth of five species of prairie-stream cyprinids. Environmental Biology of Fishes 72:45-54.

Summary of New Information

Only the abstract for this source was obtained - this summary is derived solely from the abstract, and authors of an updated Species Conservation Assessment for flathead chub are encouraged to obtain and review the entire source. The effect of hatch date on first-summer growth of several species of prairie fish was evaluated. Reproduction occurred from April - August, with 2 distinct reproductive "pulses" during that period. Growth was generally greater for individuals with earlier hatch dates; young hatched later in the summer grew at slower rates.

Relevant Sections of the Conservation Assessment Affected by the Updates

Biology and Ecology, Breeding Biology

Source 8

Galat, D.L. 2005. Spatiotemporal patterns and changes in Missouri River fishes. American Fisheries Society Symposium 45:249–291.

Summary of New Information

This document outlines the status and ecology of fish within the entire Missouri River Basin, with source to major disturbances and environmental changes as well as the conservation and management efforts needed to restore and maintain native fauna. Flathead chubs are described as big river, fluvial specialists whose elongate bodies are well-adapted to feeding (primarily on invertebrates) in heavy and turbid currents. Most of the changes to the Missouri River system over the past century have directly altered the conditions most needed by flathead chub - namely, reservoir construction and channelization have reduced flows and flow variability, and have also reduced suspended sediment loads. Further, these conditions have favored other species (some of which have been deliberately introduced), which has increased rates of predation on and competition with flathead chub. Flathead chubs are now rather rare in the main stem Missouri River, especially below the river's highest major dam (Fort Peck Reservoir). Restoration of more native flow regimes is one of several management actions that would enhance recovery of flathead chub in this system. See source 12.

Relevant Sections of the Conservation Assessment Affected by the Updates

Management Status, Biology and Ecology, Distribution and Abundance, Population trends, Community Ecology, Potential Threats, Potential Management of the Species in Region 2

Source 9

Haslouer, S.G, M.E. Eberle, D.R. Edds, K.B. Gido, C.S. Mammoliti, J.R. Triplett, J.T. Collins, D.A. Distler, D.G. Huggins, and W.J. Stark. 2005. Current status of native fish species in Kansas. Transactions of the Kansas Academy of Science 108:32-46.

Summary of New Information

A comprehensive evaluation of the status of Kansas fishes suggests that 54 of 116 native species should be assigned special conservation status because of significant declines in abundance and/or distribution. Flathead chub is recommended to be elevated from its current state "threatened" status to state "endangered". The species is critically endangered in Kansas - a recent observation in the Arkansas River near the Colorado border is basically all that keeps the taxon from being listed as extirpated from the state. See source 16.

Relevant Sections of the Conservation Assessment Affected by the Updates

Management Status, Biology and Ecology, Distribution and Abundance, Population trends, Conservation Status of Flathead Chub in Region 2

Source 10

Kral, J.G. and C.R. Berry. 2005. Fishes at randomly selected sites on wadeable streams in South Dakota. Proceedings of the South Dakota Academy of Science 84:305-313.

Summary of New Information

A broad-scale electrofishing survey in South Dakota documented flathead chub as rather abundant in streams of western South Dakota (9% of all western South Dakota fish captured; third most abundant species there), but absent in streams of eastern South Dakota.

Relevant Sections of the Conservation Assessment Affected by the Updates

Management Status, Biology and Ecology, Distribution and Abundance, Population trends, Conservation Status of Flathead Chub in Region 2

Source 11

Neely, B., S. Kettler, J. Horsman, C. Pague, R. Rondeau, P. Comer, L. Grunau, G. Belew, F. Pusateri, B. Rosenlund, D. Runner, J. Sovell, D. Anderson, T. Jackson and M. Klavetter. 2006. Central Shortgrass Prairie ecoregional assessment and partnership initiative. The Nature Conservancy / Department of Defense Legacy Resource Management Program / Colorado Division of Wildlife.

Summary of New Information

One of the latest in a series of "ecoregional plans" from The Nature Conservancy, this source details a process of (1) identifying priority components of biological diversity in the Central Shortgrass Prairie, (2) mapping the distribution of those components, and (3) using a spatially-explicit analysis to derive an efficient suite of sites that, if put under conservation action, would conserve the majority of existing biological diversity in the ecoregion. Flathead chub was selected as one priority component for the Central Shortgrass Prairie. The document concludes with several recommendations on how to proceed on implementing the plan and effecting conservation for all targets.

Relevant Sections of the Conservation Assessment Affected by the Updates

Existing Regulatory Mechanisms, Mgmt Plans, and Conservation Strategies, Potential Management of the Species in Region 2

Source 12

Quist, M.C., Hubert, W.A., and F.J. Rahel. 2004. Relations among habitat characteristics, exotic species, and turbid-river Cyprinids in the Missouri River drainage of Wyoming. Transactions of the American Fisheries Society 133:727–742.

Summary of New Information

Flathead chub was the most common of the 4 turbid-river cyprinids sampled in the Missouri River drainage of Wyoming. The species occurred in every sampled sub-drainage except the North Platte and Little Missouri Rivers. The collective abundance of the 4 turbid-river cyprinids was positively related to the percentage of fine substrate in a stream reach, and negatively related to the percentage of gravel substrate, rocky substrate, and abundance of exotic piscivores. In turn, substrate texture and presence of exotic piscivores was related to the presence and location of large main-stem impoundments. Stream reaches distant from impoundments had finer substrate and fewer exotic piscivores; reaches close to and upstream of impoundments had fine substrates, but many exotic piscivores; and reaches close to and downstream of impoundments had coarse substrates and many exotic piscivores. Reservoir management that maintains natural flows and

sediment transport regimes, and reduces the presence of exotic piscivores, is crucial for recovery of flathead chub. See source 8.

Relevant Sections of the Conservation Assessment Affected by the Updates

Biology and Ecology, Distribution and Abundance, Population trends, Community Ecology, Potential Threats, Conservation Status of the Flathead Chub in Region 2, Potential Management of the Species in Region 2

Source 13

Simons, A.M., P.R. Berendzen, and R.L. Mayden. 2003. Molecular systematics of North American phoxinin genera (Actinopterygii: Cyprinidae) inferred from mitochondrial 12S and 16S ribosomal RNA sequences. Zoological Journal of the Linnean Society 139: 63–80.

Summary of New Information

Mitochondrial DNA analysis supports previous conclusions as to Genus-level taxonomy and relationships of flathead chub; namely, the genera *Platygobio* and *Macrhybopsis* form a rather distinct cyprinid clade.

Relevant Sections of the Conservation Assessment Affected by the Updates

Biology and Ecology, Systematics and Species Description

Source 14

Welker, T.L. and D.L. Scarnecchia. 2004. Habitat use and population structure of four native minnows (family Cyprinidae) in the upper Missouri and lower Yellowstone rivers, North Dakota (USA). Ecology of Freshwater Fishes 13:8-22.

Summary of New Information

Fish were sampled along each of 4 segments of the Missouri and Yellowstone Rivers in western North Dakota. Three of the segments were considered "moderately altered" from their native conditions, and 1 segment was considered "quasi-natural". Flathead chub was the most abundant of the 4 minnow species analyzed, and was most abundant in 1 moderately altered stream segment and the quasi-natural stream segment. Ninety-nine percent of captured flathead chubs were caught in shallow, low velocity border channel habitat (as opposed to deep, high-velocity main channel habitat). The results confirm the standing assumptions regarding flathead chub habitat use, and also the reasons for its decline: the species prefers large streams and rivers with naturally fluctuating hydrographs, high sediment loads, and diverse channel structures including shallow borders and backwaters. A century of channelization and impoundment of Great Plains streams has substantially changed each of these conditions across most of flathead chub range.

Relevant Sections of the Conservation Assessment Affected by the Updates

Biology and Ecology, Distribution and Abundance, Population trends, Community Ecology, Potential Threats, Conservation Status of the Flathead Chub in Region 2, Potential Management of the Species in Region 2

Source 15

Welker, T.L. and D.L. Scarnecchia. 2006. River alteration and niche overlap among three native minnows (Cyprinidae) in the Missouri River hydrosystem. Journal of Fish Biology 68:1530–1550.

Summary of New Information

Habitat use and niche overlap of 3 native cyprinids were studied on 2 altered and 2 quasi-natural stream segments on the Missouri and Yellowstone Rivers in western North Dakota and eastern Montana. Flathead chub was the most frequently-captured species, and showed a strong psource for shallow, low-velocity channel borders with fine substrates. Furthermore, habitat use by flathead

chubs overlapped more with other native cyprinids in the quasi-natural stream segments than in the altered stream segments. The authors interpret their results to suggest that flathead chubs are rarer in altered stream segments primarily because of a lack of suitable habitat and not because of increased competition from other native cyprinids.

Relevant Sections of the Conservation Assessment Affected by the Updates

Biology and Ecology, Distribution and Abundance, Population trends, Community Ecology, Potential Threats, Conservation Status of the Flathead Chub in Region 2, Potential Management of the Species in Region 2

Source 16

Wasson, T., L. Yasui, K. Brunson, S. Amend, and V. Ebert. 2005. A future for Kansas wildlife: Kansas' comprehensive wildlife conservation strategy. Dynamic Solutions Inc. in cooperation with Kansas Department of Wildlife and Parks. Topeka, Kansas, USA.

Summary of New Information

This document is the Comprehensive Wildlife Conservation Strategy for the state of Kansas, and serves as a strategic plan that identifies broad priorities of species habitats, management and conservation issues, and, by inference, management and conservation strategies. Flathead chub is identified as a "Tier 1" priority species in Kansas, and as such is described in this plan as to its distribution, status, habitat use, threats, and likely responses to particular management actions. This source provides many management recommendations for flathead chub habitat. See sources 3 and (especially) 9.

Relevant Sections of the Conservation Assessment Affected by the Updates

Existing Regulatory Mechanisms, Mgmt Plans, and Conservation Strategies, Biology and Ecology, Distribution and abundance, Population trend, Habitat, Threats, Conservation Status of the Flathead Chub in Region 2, Potential Management of the Species in Region 2

Source 17

Personal communications with individual biologists and land managers in Region 2 regarding flathead chub ecology, management, and conservation.

Doug Keinath (Lead Zoologist, Wyoming Natural Diversity Database - University of Wyoming; dkeinath@uwyo.edu; 307 766-3023). The Wyoming Natural Diversity Database is currently working with the Wyoming Game and Fish Department to compile a complete set of all known flathead chub sightings in the state. Preliminary indications are that there has been no substantial range expansion or contraction in the state relative to previous distribution maps for this species. This dataset will be available upon request.

Rick Schneider (Nebraska Natural Heritage Program; Rick.Schneider@ngpc.ne.gov). Steve Schainost (Nebraska Game Fish and Parks; 308 763-2940; steve.schainost@ngpc.ne.gov) has compiled data from a recent statewide streams inventory in Nebraska, and has also compared it to similar inventories performed 30 years ago. The comparison suggests a large decline in flathead chub distribution.

Doug Backlund (South Dakota Natural Heritage Program; Doug.Backlund@state.sd.us). Suggested direct contact with C. Berry (South Dakota State University) for updates on current research projects relevant to flathead chub. There is some controversy regarding occurrence of flathead chub in the Big Sioux and Vermillion Rivers of eastern South Dakota. Historically, a few specimens may have wandered short distances up these rivers from their primary range in the Missouri River, but it is unlikely they occupied substantial segments of either the Big Sioux or the Vermillion. Thus these streams may not be legitimately considered historic range.

Larry Gerard (USDI Bureau of Land Management Buffalo FO; larry_gerard@blm.gov). LG suggested contact with Dave Peterson (davep@usgs.gov) and Windy Davis (wdavis@montana.edu) for information being developed as part of an aquatic monitoring project.

Frank Rahel (University of Wyoming; frahel@uwyo.edu). FR is unaware of any information that substantially changes our knowledge of flathead chub in this region. He suggests contact with Gordon Edwards (Wyoming Game and Fish Department; 307 473-3418) for possible new information being developed as part of a project monitoring the effects of coalbed methane development on fish.

Additional Unabstracted Sources – *pre*-Assessment

(citations pre-dating Assessment publication that were not referenced in it).

None.

Additional Unabstracted Sources – *post*-Assessment

(citations post-dating Assessment publication that refer to the target genus but were determined by the reviewer to contain no information requiring an update of the original assessment)

Barko, V.A., M.W. Palmer, and D.P. Herzog. 2004. Influential environmental gradients and spatiotemporal patterns of fish assemblages in the unimpounded Upper Mississippi River. American Midland Naturalist 152:369–385.

Barko, V.A., D.P. Herzog, and M.W. Palmer. 2004. Relationship among fish assemblages and main-channel-border physical habitats in the unimpounded Upper Mississippi River. Transactions of the American Fisheries Society 133:371–384.

Cowley, D. 2006. Strategies for ecological restoration of the Middle Rio Grande in New Mexico and recovery of the endangered Rio Grande silvery minnow. Reviews in Fisheries Science 14:169-182.

Doisy, K.E. and C.F. Rabeni. 2004. Effects of suspended sediment on native Missouri fishes: a literature review and synthesis. Department of Fisheries and Wildlife / Missouri Cooperative Fish and Wildlife Research Unit, University of Missouri - Columbia. Columbia, Missouri, USA.

Duehr, J.P. 2004. Fish and habitat relations at multiple spatial scales in Cheyenne River Basin, South Dakota. MS Thesis, South Dakota State University. Brookings, South Dakota, USA.

Durham, B.W. and G.R.Wilde. 2005. Relationship between hatch date and first-summer growth of five species of prairie-stream cyprinids. Environmental Biology of Fishes 72:45-54.

Galat, D.L. 2005. Spatiotemporal patterns and changes in Missouri River fishes. American Fisheries Society Symposium 45:249–291.

Haslouer, S.G, M.E. Eberle, D.R. Edds, K.B. Gido, C.S. Mammoliti, J.R. Triplett, J.T. Collins, D.A. Distler, D.G. Huggins, and W.J. Stark. 2005. Current status of native fish species in Kansas. Transactions of the Kansas Academy of Science 108:32-46.

Kral, J.G. and C.R. Berry. 2005. Fishes at randomly selected sites on wadeable streams in South Dakota. Proceedings of the South Dakota Academy of Science 84:305-313.

Neely, B. S. Kettler, J. Horsman, C. Pague, R. Rondeau, P. Comer, L. Grunau, G. Belew, F.Pusateri, B. Rosenlund, D. Runner, J. Sovell, D. Anderson, T. Jackson and M. Klavetter. 2006. Central Shortgrass Prairie ecoregional assessment and partnership initiative. The Nature Conservancy / Department of Defense Legacy Resource Management Program / Colorado Division of Wildlife.

Quist, M.C., Hubert, W.A., and F.J. Rahel. 2004. Relations among habitat characteristics, exotic species, and turbid-river Cyprinids in the Missouri River drainage of Wyoming. Transactions of the American Fisheries Society 133:727–742.

Simons, A.M., P.R. Berendzen, and R.L. Mayden. 2003. Molecular systematics of North American phoxinin genera (Actinopterygii: Cyprinidae) inferred from mitochondrial 12S and 16S ribosomal RNA sequences. Zoological Journal of the Linnean Society 139: 63–80.

Welker, T.L. and D.L. Scarnecchia. 2004. Habitat use and population structure of four native minnows (family Cyprinidae) in the upper Missouri and lower Yellowstone rivers, North Dakota (USA). Ecology of Freshwater Fishes 13:8-22.

Welker, T.L. and D.L. Scarnecchia. 2006. River alteration and niche overlap among three native minnows (Cyprinidae) in the Missouri River hydrosystem. Journal of Fish Biology 68: 1530–1550.

Checklist of Sources Consulted for Updates to the Flathead Chub Conservation Assessment

Guidelines for Producing Updates

Sources of information relevant to review of this Technical Conservation Assessment for updates include databases, experts, personal communications, published and unpublished literature. Positive results are discussed in detail in the Summary of Addendum to the Technical Conservation Assessment.

Internet Literature Searches: The minimal search for each update consists of Google Scholar, Federal Register, plus a minimum of three other available online literature databases. Search terms include at a minimum: species common name, genus, and recent synonyms. Other keywords will be used at the discretion of the updater (e.g., passerine, wetland, rodent). Searches will be constrained to the time beginning two years prior to publication of the Technical Conservation Assessment to the present.

Two attempts were made to contact experts and agency personnel.

Table A. Sources of information consulted for updates to the Species Conservation Assessment.

Source Category	Source/ Name	Date	Results
Announcement from R2 to all FS personnel (including species list)			No global announcement was made. See individual contacts below.
Internet based literature databases	Google		Basic Google search was not performed due to abundance of irrelevant documents.
	Google Scholar	20 July 2006	Unconstrained search on "Flathead chub" = **581** documents; same for "Platygobio gracilis" = **160** documents. Search on "Flathead chub" documents published b/t 2003 - present = **27**; same for "Platygobio gracilis" = **27**; same for "Flathead chubs" = **2**. *12 relevant publications extracted from latter 3 searches*
	Federal Register	20 July 2006	Search terms "Flathead chub", "Flathead chubs, "Platygobio gracilis" for volumes 2003 - present. *0 new relevant sources*
	University of Wyoming Library Catalog	20 July 2006	Search terms "Flathead chub", "Flathead chubs", "Platygobio gracilis" for 2003 - present. *0 new relevant sources*
	Wildlife and Ecology Studies Worldwide	20 July 2006	Search terms "Flathead chub", "Flathead chubs", "Platygobio gracilis" for 2003 - present. *0 new relevant sources*

Source Category	Source/ Name	Date	Results
	Scopus	20 July 2006	Search terms “Flathead chub”, “Flathead chubs”, “Platygobio gracilis” for 2003 - present. *1 new relevant source*
	Web of Science	20 July 2006	Search terms “Flathead chub”, “Flathead chubs”, “Platygobio gracilis” for 2003 - present. *0 new relevant sources*
	Agricola	20 July 2006	Search terms “Flathead chub”, “Flathead chubs”, “Platygobio gracilis” for 2003 - present. *0 new relevant sources*
	Biological Abstracts	20 July 2006	Search terms “Flathead chub”, “Flathead chubs”, “Platygobio gracilis” for 2003 - present. *0 new relevant sources*
	WorldCat	20 July 2006	Search terms “Flathead chub”, “Flathead chubs”, “Platygobio gracilis” for 2003 - present. *0 new relevant sources*
NatureServe affiliate program databases and personnel	Wyoming Natural Diversity Database (D. Keinath; dkeinath@uwyo.edu)	8 Aug 2006	*DK response summarized and on file*
	Colorado Natural Heritage Program (J. Sovell; jsovell@lamar.colostate.edu)	8 Aug 2006	JS responded with no new information
	Nebraska Natural Heritage Program (R. Schneider; Rick.Schneider@ngpc.ne.gov)	8 Aug 2006	*RS response summarized and on file; also forwarded message to many colleagues*

Source Category	Source/ Name	Date	Results
	South Dakota Natural Heritage Program (D. Backlund; Doug.Backlund@state.sd.us)	8 Aug 2006	*DB response on file and summarized.*
	Kansas Natural Heritage Program (William Busby; wbusby@ku.edu)	8 Aug 2006	*BB provided 1 new source*
State Agency Personnel	--none--		
Federal Agency Personnel	USDA Forest Service Medicine Bow Routt NF/ TBNG (Tim Byer; tbyer@fs.fed.us)	8 Aug 2006	No response
	USDA Forest Service Buffalo Gap NG (Doug Sargent; dsargent@fs.fed.us)	8 Aug 2006	No response
	USDA Forest Service Black Hills NF (Cara Staab; cstaab@fs.fed.us)	8 Aug 2006	CS responded with no new information, but forwarded the message to colleagues
	USDA Forest Service Fort Pierre NG (Glen Moravek; gmoravek@fs.fed.us)	8 Aug 2006	No response
	USDA Forest Service Oglala NG (Jeff Abegglen; jsabegglen@fs.fed.us); Jason Brewer; jasonbrewer@fs.fed.us)	8 Aug 2006	JA responded with no new information, but forwarded the message to colleagues
	USDA Forest Service Cimarron NG (Andy Chappell; atchappell@fs.fed.us)	8 Aug 2006	AC responded with no new information
	USDA Forest Service Pawnee NG (Beth Humphrey; bhumphrey@fs.fed.us)	8 Aug 2006	No response
	USDA Forest Service Comanche NG (Dave Augustine; daugustine@fs.fed.us)	8 Aug 2006	DA responded with no new information

Source Category	Source/ Name	Date	Results
	USDI Bureau of Land Management Buffalo FO (Larry Gerard; larry_gerard@blm.gov)	8 Aug 2006	*LG Response summarized and on file*
	USDI Bureau of Land Management Newcastle FO (Lynnda Jackson; lynnda_jackson@blm.gov)	8 Aug 2006	LJ responded with no new information, but forwarded the message to colleagues
	USDI Bureau of Land Casper FO (Jim Wright; jim_wright@blm.gov; Sara Bucklin-Commiskey; Sarah_Bucklin-Comiskey@blm.gov)	8 Aug 2006	No response
	USDI Bureau of Land Management Lander FO (Sue Oberlie; sue_oberlie@blm.gov)	8 Aug 2006	SO responded with no new information, but forwarded the message to colleagues
	USDI Bureau of Land Management Cody FO (Dennis Saville; Dennis_Saville@blm.gov)	8 Aug 2006	No response
	USDI Bureau of Land Management Worland FO (Kim Stephens; kim_stephens@blm.gov; Tom Ball; tom_ball@blm.gov)	8 Aug 2006	No response
	USDI Bureau of Land Management Royal Gorge FO (Eric Brekke; eric_brekke@blm.gov)	8 Aug 2006	No response
Primary experts		--	None contacted
Museums and Herbaria		--	No search performed
Internal USFS Intranet search		--	No search performed

Source Category	Source/ Name	Date	Results
Original Author	Frank J. Rahel (University of Wyoming; frahel@uwyo.edu)	10 Aug 2006	*FR response summarized and on file*
	Laura Thel	--	Not contacted
(Other)			NA